



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,579	04/02/2004	Yi-Chou Chen	JCLA12120	2590
23900	7590	05/17/2005	EXAMINER	
J C PATENTS, INC. 4 VENTURE, SUITE 250 IRVINE, CA 92618			HO, TU TU V	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 05/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/817,579	Applicant(s) CHEN ET AL	
	Examiner Tu-Tu Ho	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on 04/02/2004 is acceptable.

Priority

2. It appears that a certified copy has been received by the Office, but the certified copy appears to be un-scannable and appears to be identified as document "ARTIFACT" 07/15/2004 of the record.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. **Claims 1-2, 5-8, and 12** are rejected under 35 U.S.C. 102(b) as being anticipated by Yamada et al. U.S. Patent 6,858,277 (the '277 reference).

The '277 reference discloses in the figures, particularly Fig. 10, and respective portions of the specification a memory device of chalcogenide phase-change non-volatile memory and a

Art Unit: 2818

method of fabricating a memory device of chalcogenide phase-change non-volatile memory as claimed.

Referring to **claims 1 and 6**, the reference discloses a memory device of chalcogenide phase-change non-volatile memory and a method of fabricating thereof, comprising;

a top electrode (27, Fig. 10);

a bottom electrode (24); and

a phase-change thin film (26) between the top electrode and the bottom electrode, wherein the phase-change thin film is a chalcogenide alloy (column 1 through column 6, particularly column 1, lines 50-55, and column 3, lines 10-15), doped with an element (Sn) therein (column 5, lines 20-24), and the element enhances a crystallization rate (“crystallization speed”, column 5, lines 20-24) of the chalcogenide alloy.

Referring to **claims 2 and 12**, as detailed above, the reference discloses that the element includes tin (Sn).

Referring to **claim 5**, the reference further discloses that the chalcogenide alloy is $\text{Ge}_2\text{Sb}_2\text{Te}_5$ (column 8, lines 1-10).

Referring to **claims 7 and 8**, the reference further discloses that the method of forming the phase-change thin film is performed by a sputtering process using a chalcogenide target doped with the element therein (column 5, lines 40-54), and since the reference discloses that the sputtering process could include other elements, the sputtering process could be named “co-sputtering” as claimed in claim 8.

Art Unit: 2818

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 3-4 and 9-11** are rejected under 35 U.S.C. §103(a) as being unpatentable over Yamada et al. U.S. Patent 6,858,277 (the '277 reference).

Referring to **claims 3 and 4**, The '277 reference discloses a memory device of chalcogenide phase-change non-volatile memory by doping the chalcogenide alloy with a material to enhance crystallization rate of the chalcogenide alloy as claimed and as detailed above for claim 1, but fails to disclose a specific range of mole ratios of the element within the chalcogenide alloy as claimed. However, it was within the skill of an ordinary artisan in the art, therefore would have been obvious, to choose a specific range of mole ratios of the element within the chalcogenide alloy because the artisan realizes that doping the element into the chalcogenide alloy would result in an improvement in the crystallization rate of the chalcogenide alloy. In other words, since criticality of the various ranges of values has not been established, it would be a matter of routine experimentation and therefore would be within the skill of an ordinary artisan in the art - and therefore would have been obvious - to select an appropriate value or range of values of mole ratios for the given application as doping to enhance crystallization rate of the chalcogenide alloy.

Referring to **claims 9-11**, as detailed above for claims 6-8, the reference teaches a sputtering process to enhance crystallization rate of the chalcogenide alloy as claimed for claims

Art Unit: 2818

7 and 8, therefore it can not be said that the reference anticipates the claimed processes of ion-implantation, diffusion, and co-evaporation of claims 9-11. However, the various processes all apparently serve the same purpose of enhancing crystallization rate of the chalcogenide alloy, therefor it also can not be said that any process is patentable over the others; hence changing the process would have been obvious to one of ordinary skill in the art.

5. **Claims 1-17** are rejected under 35 U.S.C. §103(a) as being unpatentable over Moore et al. U.S. Patent Application Publication 20050007852 (the '852 reference) in view of Yamada et al. U.S. Patent 6,858,277 (the '277 reference) or **claims 13-17** are rejected under 35 U.S.C. §103(a) as being unpatentable over the '277 reference in view of the '852 reference.

Referring to **claims 13-17**, the '277 reference discloses a memory device of chalcogenide phase-change non-volatile memory and a method of fabricating thereof substantially as claimed and as detailed above for claims 1-12 but fails to teach that the memory device could be used in an array including a word line, a bit line, and a selective device as claimed in claims 13-17. Specifically, the reference appears to disclose a single-cell device. However, at the time the invention was made, it was known that memory cells were organized into arrays of multiple cells, such as an array disclosed in Fig. 4 of the '852 reference, to be used in various application, because single-cell device does not appear to be used directly in any application. Therefore, it would have been obvious to one of ordinary skill in the art the time the invention was made to form the reference's appear-to-be-single-cell device so that the memory cells were organized into arrays of multiple cells, such as an array disclosed in Fig. 4 of the '852 reference, because single-cell device did not appear to be used directly in any application.

Referring to **claims 1-17**, the '852 reference discloses a chalcogenide phase-change non-volatile memory comprising a word line (106, Fig. 4), a bit line (108), which is electrically coupled to the word line, a selective device (102, Figs. 2-4), which is electrically coupled to the word line and the bit line, and a memory device (104), which is electrically coupled to the selective device, wherein the memory device comprises a top electrode (110, Fig. 3), a bottom electrode (114) and a phase-change thin film (no number) between the top electrode and the bottom electrode, and the phase-change thin film is a chalcogenide alloy (paragraphs [0009] and [0042]). The reference further discloses that the chalcogenide alloy comprises Ge, Sb, and Te (paragraphs [0009] and [0042]).

However, the '852 reference fails to teach that the phase-change thin film is doped with an element therein so as to enhance the crystallization rate of the chalcogenide alloy.

Nevertheless, the '277 reference, in also disclosing a memory device of chalcogenide phase-change non-volatile memory and a method of fabricating thereof substantially as claimed and as detailed above for claims 1-12, teaches doping the phase-change thin film comprising Ge, Sb, and Te with an element including tin so as to enhance the crystallization rate of the chalcogenide alloy.

Therefore, it would have been obvious to one of ordinary skill in the art the time the invention was made to form the '852 reference's chalcogenide phase-change non-volatile memory device so that the phase-change thin film doped with an element including tin. One would have been motivated to make such a change because phase-change thin film doped with an element including tin enhances the crystallization rate, or as disclosed tangibly by the '277 reference as to improve crystallization speed, of the chalcogenide alloy.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho
May 12, 2005